

| SED CABid: ES1909 | Test Report No: |
|---|--|
| ab. Company Number: 4621A | 72449RRF.005A1 |
| Test Report USA FCC Part 15.225, 1 CANADA RSS-210, RSS | |
| (*) Identification of item tested | XS4 Original+ Electronic Lock Series including all mechanical variants |
| (*) Trademark | SALTO |
| (*) Model and/or type reference | W41M (Type reference: E2131) |
| Other identification of the product | FCC ID: UKCW41M IC ID: 10088A-W41M |
| (*) Features | Features: Bluetooth LE HW version: 1.0 SW version: 0174 (Control FW), 0186 (FUS FW) 0187 (BLE FW), 0202 (Motor FW) |
| Applicant | SALTO SYSTEMS, S.L. Arkotz 9, Polígono Lanbarren 20180, Oiartzun, Gipuzkoa, SPAIN |
| Test method requested, standard | USA FCC Part 15.225 (10-1-21 Edition): Operation within the band 13.110 -14.010. USA FCC Part 15.209 (10-1-21 Edition): Radiated emissio limits, general requirements. CANADA RSS-210 Issue 10 (December 2019). CANADA RSS-Gen Issue 5 (March 2019). ANSI C63.10-2013: American National Standard for Testin Unlicensed Wireless Devices. |
| Summary | IN COMPLIANCE |
| Approved by (name / position & signature) | José Manuel Gómez Galván EMC Consumer & RF Lab. Manager |
| Date of issue | 2023-05-18 |
| Report template No | FDT08_24 (*) "Data pr ovided by the client" |





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Competences and guarantees

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DEKRA Testing and Certification is a FCC-recognized accredited testing laboratory with appropriate scope of accreditation that covers the performed tests in this report.

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Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Testing and Certification internal document PODT000.

The total uncertainty of the measurement system for the radiated emissions of EUT from 9 kHz to 30 MHz is: Measurement uncertainty $\leq \pm 3.08$ dB (with factor k = 2).

The total uncertainty of the measurement system for the radiated emissions of EUT from 30 MHz to 200 MHz is: Measurement uncertainty $\leq \pm 5.35$ dB (with factor k = 2).

The total uncertainty of the measurement system for the conducted testing of EUT is: Frequency Tolerance of the Carrier Signal: Measurement uncertainty ≤ ± 12.3 kHz Occupied Bandwidth ≤ ± 1.70 kHz Field strength of emissions within the band ≤ ± 3.44 dB



Data provided by the client

The following data has been provided by the client:

- 1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
- 2. The sample consists of a XS4 Original+ Electronic Lock Series with RFID Mifare (ISO14443A & ISO15693 standard based) and Bluetooth LE technology.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: The client.

| ld | Control Number | Description | Model | Serial Nº | Date of Reception | Application | |
|------|----------------|----------------------------------|-------|-----------|-------------------|-----------------------|--|
| S/01 | 72449_17.1 | XS4 Original+ Electronic Lock | W41M | | 2022-10-21 | Element Under Test | |
| S/02 | 72449_8.1 | XS4 Original+ Electronic Lock | W41M | | 2022-10-21 | Element Under Test | |
| S/02 | 66344B_27.1 | Battery holder | | | 2021-09-20 | Auxiliary Element | |

Notes referenced to samples during the project:

| ld | Туре |
|------|--------------------------------|
| S/01 | Sample used for radiated test |
| S/02 | Sample used for conducted test |



Test sample description

| Ports: | Port name and description | | Cable | | | | | | | |
|---|---|-----------------------|--------------------------------|-------------------------|----|---------|---------|--------|-----------------------------------|--|
| | | | Specified max length [m] | Attached during test | | Shielde | hielded | | Coupled to patient ⁽³⁾ | |
| | | | | [] | | [] | [] | | [] | |
| Supplementary information to the ports: | | | - | - | | | | | | |
| Rated power supply : | Voltage and Frequency | | | | | | | | | |
| | | , , , | | L1 | L2 | L3 | | N | PE | |
| | [] | AC: | | [] | [] | [] | [|] | [] | |
| | [X] | DC: 4.5 Vdc (3 x L | R03 batteries |) | | | | | | |
| Rated Power : | | | | | | | | | | |
| Clock frequencies: | 27.12 | MHz, 32 MHz, 32.7 | 68 KHz | | | | | | | |
| Other parameters: | N/A | | | | | | | | | |
| Software version: | 0174 (Control FW) + 0186 (FUS FW) + 0187 (BLE FW) + 0202 (Motor FW) | | | | | | | | | |
| Hardware version: | 1.0 | | | | | | | | | |
| Dimensions in cm (W x H x D) : | 4.0 x 28.2 x 2.0 cm | | | | | | | | | |
| Mounting position: | [] Table top equipment | | | | | | | | | |
| | [] Wall/Ceiling mounted equipment | | | | | | | | | |
| | [] | Floor standing equ | uipment | | | | | | | |
| | [] | Hand-held equipm | ient | | | | | | | |
| | [X] | Other: Door moun | ting | | | | | | | |
| Modules/parts: | Modu | le/parts of test item | | | Ту | pe | Ma | nufact | turer | |
| | SoC + Antenna BLE ST | | ST + JOHANSON | | | | | | | |
| | | | | | | | | | | |
| Accessories (not part of the test item) | Description Type Manufacturer | | | er | | | | | | |
| | | | | | | | | | | |
| Documents as provided by the applicant | Description File name Issue date | | | date | | | | | | |
| appilodi It | User manual | | | | | | | | | |
| | FW Explanation | | | | | | | | | |
| | | | | | | | | | | |

⁽³⁾ Only for Medical Equipment



Identification of the client

SALTO SYSTEMS, S.L. Arkotz 9, Polígono Lanbarren 20180, Oiartzun, Gipuzkoa, SPAIN

Testing period and place

| Test Location | DEKRA Testing and Certification S.A.U. | |
|---------------|--|--|
| Date (start) | 2022-09-11 | |
| Date (finish) | 2022-12-17 | |

Document history

| Report number | Date | Description | | |
|---------------|------------|---|--|--|
| 72449RRF005 | 2023-02-21 | First release. | | |
| 72449RRF005A1 | 2023-05-18 | Test report is modified due to missing info. This modification test report cancels and replaces the test report 72449RRF.005. | | |

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

| Temperature | Min. = 15 °C Max. = 35 °C |
|-------------------|------------------------------|
| Relative humidity | Min. = 20 % Max. = 75 % |

In the semianechoic chamber, the following limits were not exceeded during the test.

| Temperature | Min. = 15 °C Max. = 35 °C |
|-------------------|------------------------------|
| Relative humidity | Min. = 20 % Max. = 75 % |

In the chamber for conducted measurements, the following limits were not exceeded during the test:

| Temperature | Min. = 15 °C Max. = 35 °C |
|-------------------|------------------------------|
| Relative humidity | Min. = 20 % Max. = 75 % |



Remarks and comments

The tests have been performed by the technical personnel: Pablo Redondo, Miguel Manuel Lopez and Francisco Javier Fernandez.

Used instrumentation:

| Control No. | Equipment | Model | Manufacturer | Next Calibration |
|----------------|--|----------------|----------------------|---------------------|
| 6791 | SEMIANECHOIC ABSORBER LINED CHAMBER | FACT 3 200 STP | ETS LINDGREN | N/A |
| 6792 | SHIELDED ROOM | S101 | ETS LINDGREN | N/A |
| 0242 | ACTIVE LOOP ANTENNA 9 KHZ-30 MHz | 11966A | HEWLETT PACKARD | 2024-08-18 |
| 6143 | HYBRID BILOG ANTENNA 30MHz-6GHz | 3142E | ETS LINDGREN | 2023-10-29 |
| 6142 | PRE-AMPLIFIER G>38dB 30MHz-6GHz | BLNA 0360-01N | BONN ELEKTRONIK | 2023-06-16 |
| 6165 | EMI TEST RECEIVER 9kHz- 7GHz | ESR7 | ROHDE AND SCHWARZ | 2023-11-08 |
| 7817 | EMI TEST RECEIVER 2Hz- 44GHz | ESW44 | ROHDE AND SCHWARZ | 2023-12-30 |
| 0922 | DC POWER SUPPLY 40V/40A | NGPE 40/40 | ROHDE AND SCHWARZ | N/A |
| 7760 | DIGITAL MULTIMETER | 175 | FLUKE | 2023-11-14 |
| 8002 | TEMPERATURE CHAMBER | MK 56 | BINDER | 2023-03-22 |
| 7794 | SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz | FSV40 | ROHDE AND SCHWARZ | 2023-02-26 |



Testing verdicts

| Fail | F |
|----------------|-----|
| Inconclusive | 1 |
| Not applicable | N/A |
| Not measured | N/M |
| Pass | Р |

Summary

| FCC PART 15 PARAGRAPH / RSS-210 | | | | | | |
|---|---------|--------|--|--|--|--|
| Requirement – Test case | Verdict | Remark | | | | |
| FCC 15.225 (a) / RSS-210 B.6 (a)(i) Field strength of emissions within the band 13.553 MHz -13.567 MHz | Р | | | | | |
| FCC 15.225 (b) / RSS-210 B.6 (a)(ii) Field strength of emissions within the band 13.410 - 13.553 MHz and 13.567 – 13.710 MHz | Р | | | | | |
| FCC 15.225 (c) / RSS-210 B.6 (a)(iii) Field strength of emissions within the band 13.110 - 13.410 MHz and 13.710 – 14.010 MHz | Р | | | | | |
| FCC 15.225 (d) / RSS-210 B.6 (a)(iv) Field strength of emissions outside of the band 13.110 MHz -14.010 MHz | Р | | | | | |
| FCC 15.225 (e) / RSS-210 B.6 (b) Frequency tolerance of the carrier signal | Р | | | | | |
| Supplementary information and remarks: None. | | | | | | |



Appendix A: Test results



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| FCC 15.225 (c) / RSS-210 B.6 (c). Field strength of emissions within the band 13.110 - 13.410 MHz 14.010 MHz. | |
| FCC 15.225 (d) / RSS-210 B.6 (a)(iv) Field Strength of Emissions outside of the band 13.110 MHz - | |
| FCC 15.225 (e) / RSS-210 B.6 (b) Frequency Tolerance of the Carrier Signal | 30 |



TEST CONDITIONS

(*) Data provided by the Applicant.

POWER SUPPLY (*):

| Vnominal: | 4.5Vdc |
|-----------------------|--------------------|
| Vminimum: | 3.825Vdc |
| Vmaximum: | 4.95Vdc |
| Type of Power Supply: | 3 x LR03 batteries |

ANTENNA (*):

| Type of Antenna: | Integral, PCB. |
|--------------------------------|----------------|
| Maximum Declared Antenna Gain: | N/A |

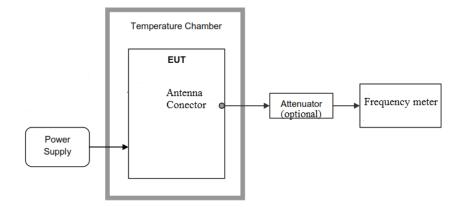
TEST FREQUENCY (*):

Nominal Operating Frequency: 13.56 MHz

CONDUCTED MEASUREMENTS:

The equipment under test was set up in a shielded room and it is directly connected to the spectrum analyzer.

For frequency stability test the EUT was placed inside a climatic chamber and connected to a frequency meter using a low loss cable. An external DC power supply was connected to the EUT for voltage variation test.





RADIATED MEASUREMENTS:

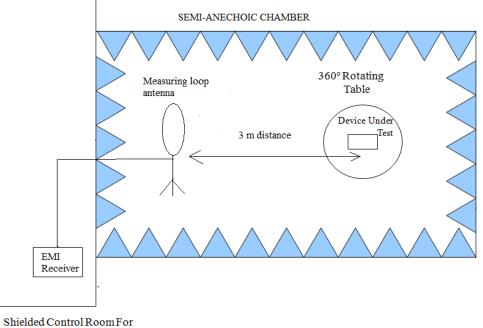
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Loop antenna for the range between 9 kHz to 30 MHz and Bilog antenna for the range between 30 MHz to 200 MHz) is situated at a distance of 3 m.

For radiated emissions in the range 9 kHz to 30 MHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 40 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and in the range between 30 MHz and 200 MHz the antenna height was varied from 1 to 4 meters to find the maximum radiated emission. In the range between 9 kHz and 30 MHz the measurements were made in the three different orientation planes of the loop antenna to determine the maximum received field.

In the range between 30 MHz and 200 MHz the measurements were made in both horizontal and vertical planes of polarization.

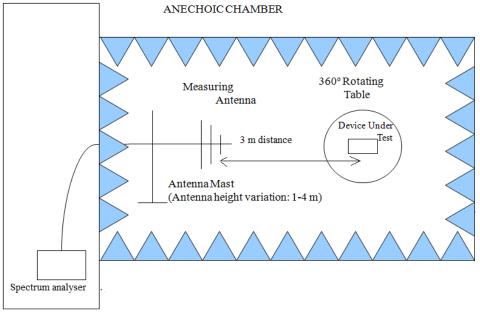
Radiated measurements setup 9 kHz to 30 MHz:



Radiated Measurements



Radiated measurements setup 30 MHz to 200 MHz:



Shielded Control Room For Radiated Measurements



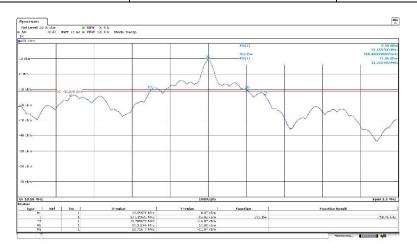
Occupied Bandwidth

RESULTS:

99 % Occupied Bandwidth and 20 dB Bandwidth.

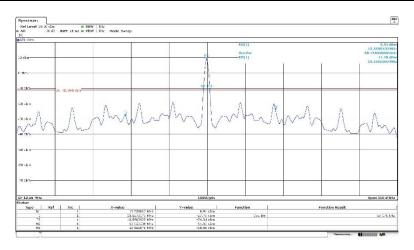
• RFID mode ISO 14443A:

| Operation mode | 99% Occupied Bandwidth (kHz) | 20 dB Bandwidth (kHz) | | |
|--------------------------------|------------------------------|-----------------------|--|--|
| RFID 13.56 MHz mode ISO 14443A | 768.45 | 383.98 | | |



• RFID mode ISO 15693:

| Operation mode | 99% Occupied Bandwidth (kHz) | 20 dB Bandwidth (kHz) | | |
|-------------------------------|------------------------------|-----------------------|--|--|
| RFID 13.56 MHz mode ISO 15693 | 59.18 | 2.54 | | |





FCC 15.225 (a) / RSS-210 B.6 (a). Field strength of emissions within the band 13.553 -13.567 MHz

SPECIFICATION:

The field strength of any emissions within the band 13.553 - 13.567 MHz shall not exceed 15,848 microvolts/meter (84 dBµV/m) at 30 meters.

RESULTS:

Measurement distance: 3 meters.

• RFID mode ISO 14443A:

The maximum field strength of fundamental emission:

| Frequency (MHz) | Maximum field strength (dBµV/m) measured at 3 m (quasi-peak detector) | Maximum field strength (dBµV/m) extrapolated to 30 m (40 dB/decade) |
|-----------------|---|---|
| 13.561 | 53.80 | 13.80 |

| ultiView Receive | or | | | | | | |
|----------------------------------|---------------------------|--------|---|----|---|-------------|----------------------------|
| Meas BW (OPK) 9 kHz | Meas Time 100 ms | | | | | | |
| Att 0 dB Input 1 DC | Preamp Off St PS On No | ep LIN | | | | Frequency 1 | 3.5670000 M |
| Finputi "0242_Antenna_Fi Scan | ield_9KHz-30MHz_08-2022" | | | | | | |
| scan | | | | | | M1 | ο 1QP Cl [1] 53.80 dBμV |
| D dBµV/m | 124.000 dBµ∀/m | | | | | | 13.561000 M |
| (dbp 1) 11 | | | | | | | |
| dBµV/m | | | | | | | |
| I dBµV/m | | | | | | | |
| - august m | | | | | | | |
| dBµV/m | | | | | | | + |
| dBµV/m | | | | | | | |
| ubp 4/11 | | | | | | | |
| dBµ∨/m | | | | | | | |
| dBµ∀/m | | | | | | | |
| oop m | | | _ | M1 | | | |
| dBµ∀/m | | | | | | | |
| dBpV/m | | | | | | | |
| apprym | | | | | | | |
| dBµV/m | | | | | | | + |
| dBµV/m | | | | | | | |
| apprym | | | | | | | |
| dBµV/m | | | | | | | + |
| | | | | | 1 | 1 | |

The limit shown in the above plot is extrapolated to 3 meters



The maximum field strength of fundamental emission:

| Frequency (MHz) | Maximum field strength (dBµV/m) measured at 3 m (quasi-peak detector) | Maximum field strength (dBµV/m) extrapolated to 30 m (40 dB/decade) |
|-----------------|---|---|
| 13.561 | 54.39 | 14.39 |

| Receiver | Spectrum 🛞 | | | | | | |
|--------------|--------------------------------------|----------------|----------------------------|-------------------------|--------------------------|-------------------------|-----------------------------|
| Input 1 DC 👄 | RBW (QPK) 9 kHz MT Att 0 dB Pream | | _MAYO2021\9kHz_30MHz_Efeil | d_3m_Ant0242.TDF ALC4_M | AYO2021\CABLE_7645_3m.TD | F ALC4_MAYO2021\CABLE_6 | |
| Scan @1QP1 | | o orr atep Lin | | | | | |
| | | | | M1[1] 0.000 s | | 5 | 4.39 dBµV/m 3.561000 MHz |
| | | | | 0.000 3 | | | |
| 120 dBµV/m— | | | | | | | |
| 110 dBµV/m | | | | | | | · |
| 110 00000 | | | | | | | |
| 100 dBµV/m | | | | | | | |
| 90 dBµV/m | | | | | | | |
| | | | | | | | |
| 80 dBµV/m | | | | | | | |
| 70 dBµV/m | | | | | | | |
| 60 dBµV/m | | | | | | | |
| | | | | M1 | | | |
| 50 dBµV/m | | | | | | | |
| 40 dBµV/m- | | | | | | | |
| 40 ασμν/m | | | | | | | |
| 30 dBµV/m | | | | | | | |
| 20 dBµV/m | | | | | | | |
| | | | | | | | |
| 10 dBµV/m | | | | | | | |
| 01 1 10 5 | | | | | | | TF |
| Start 13.553 | MHz | | | | | Stop | 13.567 MHz |

The limit shown in the above plot is extrapolated to 3 meters



FCC 15.225 (b) / RSS-210 B.6 (b). Field strength of emissions within the band 13.410 - 13.553 MHz and 13.567 - 13.710 MHz

SPECIFICATION:

Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter ($50.47 \text{ dB}\mu\text{V/m}$) at 30 meters.

RESULTS:

Measurement distance: 3 meters.

- Band 13.410 - 13.553 MHz

• RFID mode ISO 14443A:

| Frequency (MHz) | Maximum field strength (dBµV/m) measured at 3 m (quasi-peak detector) | Maximum field strength (dBµV/m) extrapolated to 30 m (40 dB/decade) |
|-----------------|---|---|
| 13.553 | 39.28 | -0.72 |

| | | | | | | | |
|-------------------------------|--|--|--------|------|------|--------------|---|
| | Receiver | | | | | | • |
| Meas BW (QPK Att Input | () 9 kHz Meas Time 0 dB Preamp 1 DC PS | e 100 ms Off Step LI On Notch O | N | | | Frequency 13 | 8.5530000 MHz |
| TDF Input1 "0242_Ar 2 Scan | ntenna_Field_9KHz-30 | MHz_08-2022" | | | | | • 1QP Clrw |
| 120 dBµV/m | | | | | | M1 | [1] 39.28 dBμV/m 13.553000 MHz |
| 110 dBµV/m | | | | | | | |
| 100 dBµV/m | | | | | | | |
| 190 dBpV/m | H1 90.470 dBuV/m | | | | | | |
| 80 dBµV/m | | | | | | | |
| 70 dBµV/m | | | | | | | |
| 60 dBµ∀/m | | | | | | | |
| 50 dBµ∀/m | | | | | | | |
| 40 dBµV/m | | | | | | | M1 |
| 30 dBµV/m | | | \sim | | | | / |
| 20 dBµV/m | | | | | | ~ | |
| 10 dBµV/m | | | | | | | |
| Start 13.41 MHz | | | | | | | TF Stop 13.553 MHz |
| 7.631 C 101 11 (0112 | | | | | | | 0.00 10/000 10/12 |

The limit shown in the above plot is extrapolated to 3 meters



| Frequency (MHz) | Maximum field strength (dBµV/m) measured at 3 m (quasi-peak detector) | Maximum field strength (dBµV/m) extrapolated to 30 m (40 dB/decade) |
|-----------------|---|---|
| 13.553 | 40.06 | 0.06 |

| Receiver | Spectrum 🗴 | | | | | |
|-------------|---------------------------------------|---------------------------|----------------------------|-------------------------|-------------------------|-------------------------------|
| Input 1 DC | RBW (CISPR) 9 kHz MT Att 0 dB Prea | .C4_MAYO2021\9kHz_30MHz_I | Efeild_3m_Ant0242.TDF ALC4 | 4_MAYO2021\CABLE_7645_3 | m.TDF ALC4_MAYO2021\CAE | 3LE_6710_11m.TDF |
| Scan 😁1QF | | | | | | |
| | | | M1[1] 0.000 s | | | 40.06 dBµV/m 13.553000 MHz |
| 120 dBµV/m- | 0 | 2 | | 2 | | |
| | | | | | | |
| 110 dBµV/m— | | | | | | |
| 100 dBµV/m- | | | | | | |
| -90 dBpV/m | D1 90.470 dBµV/m- | | | | | |
| | | | | | | |
| 80 dBµV/m— | | | | | | |
| 70 dBµV/m— | | | | | | |
| 60 dBµV/m— | | | | | | |
| | | | | | | |
| 50 dBµV/m— | | | | | | |
| 40 dBµV/m— | | | | | | M |
| 30 dBµV/m— | | | | | | |
| 30 ubpv/m | | | | ~ / | | |
| 20 dBµV/m— | | | | | | |
| 10 dBµV/m— | | | | | | |
| | | | | | | |
| Start 13.41 | MHz | | | | l s | TF top 13.553 MHz |

The limit shown in the above plot is extrapolated to 3 meters



- Band 13.567-13.710 MHz

• RFID mode ISO 14443A:

| Frequency (MHz) | Maximum field strength (dBµV/m) measured at 3 m (quasi-peak detector) | Maximum field strength (dBµV/m) extrapolated to 30 m (40 dB/decade) |
|-----------------|---|--|
| 13.567 | 39.53 | -0.47 |

| | | | | | | | < |
|-----------------------------------|--|---------------------------|---|--------|------|--------------|------------------|
| MultiView | | | | | | | • |
| Att Input | PK) 9 kHz Meas Tim 0 dB Preamp 1 DC PS | Off Step LI On Notch O | N | | | Frequency 13 | 3.7100000 MHz |
| TDF Input1 "0242_ 2 Scan | _Antenna_Field_9KHz-30 | MHz_08-2022" | | | | | 0 1QP Clrw |
| | | | | | | M1 | [1] 39.53 dBµV/m |
| 120 dBµV/m | | | | | | | 13.567000 MHz |
| | | | | | | | |
| 110 dBµV/m | | | | | | | |
| 100 dBµV/m | | | | | | | |
| 90 dBµV/m | H1 90.470 dBuV/m | | | | | | |
| 90 dbp4/m | | | | | | | |
| 80 dBµV/m | | | | | | | |
| 70 dBµ∀/m | | | | | | | |
| 60 dBµV/m | | | | | | | |
| 00 dbp1//m | | | | | | | |
| 50 dBµV/m | | | | | | | |
| M1 (40 dBµV/m−−−−− | | | | | | | |
| \land | | | | | | | |
| 30 dBµV/m | | | | | | | |
| 20 dBµV/m | | | | \sim | | | |
| | 7 | | | | | | |
| 10 dBµV/m | | | | | | | |
| | | | | | | | TF |
| Start 13.567 MH | lz | | | | | | Stop 13.71 MHz |

The limit shown in the above plot is extrapolated to 3 meters



| Frequency (MHz) | Maximum field strength (dBµV/m) measured at 3 m (quasi-peak detector) | Maximum field strength (dBµV/m) extrapolated to 30 m (40 dB/decade) |
|-----------------|---|--|
| 13.567 | 40.21 | 0.21 |

| Receiver | Spectrum 🛞 | | | | | | |
|---------------------|---------------------|--------------|---------------------------|-------------------------|-------------------------|-------------------------|--------------|
| R Input 1 DC 👄 A | | | MAYO2021\9kHz_30MHz_Efeil | d_3m_Ant0242.TDF ALC4_M | AYO2021\CABLE_7645_3m.T | DF ALC4_MAYO2021\CABLE_ | 6710_11m.TDF |
| Scan O1QP CI | | OFF Step LIN | | | | | |
| | | | | M1[1] | | 4 | 0.21 dBµV/m |
| | | | | 0.000 s | 1 | 13 | .567000 MHz |
| 120 dBµV/m | - | | | / | | | |
| | | | | | | | |
| | | | | | | | |
| 110 dBµV/m | | | | | | | |
| | | | | | | | |
| 100 dBµV/m | | | | | | | |
| | | | | | | | |
| | D4 00 470 /D 1// | | | | | | |
| 90 dBpV/m | ——D1 90.470 dBµV/m— | | | | | | |
| | | | | | | | |
| 80 dBµV/m | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 70 dBµV/m | | | | | | | |
| | | | | | | | |
| 60 dBµV/m | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 50 dBµV/m | | | | | | | |
| 1 | | | | | | | |
| 40 dBµV/m | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 30 dBµV/m | | | | | | | |
| | | | | | | | |
| 20 dBµV/m | | | | | | | |
| | | | | | | ~ | \sim |
| | | | | | | | |
| 10 dBµV/m | | | | | | | |
| | | | | | | | |
| 04 and 10 567 1 | | | | | | | TF |
| Start 13.567 N | IHZ | | | | | Sto | p 13.71 MHz |

The limit shown in the above plot is extrapolated to 3 meters



FCC 15.225 (c) / RSS-210 B.6 (c). Field strength of emissions within the band 13.110 - 13.410 MHz and 13.710 - 14.010 MHz

SPECIFICATION:

Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz, the field strength of any emissions shall not exceed 106 microvolts/meter ($40.51 \text{ dB}\mu \text{V/m}$) at 30 meters.

RESULTS:

Measurement distance: 3 meters.

- Band 13.110-13.410 MHz

• RFID mode ISO 14443A:

| Frequency (MHz) | Maximum field strength (dBµV/m) measured at 3 m (quasi-peak detector) | Maximum field strength (dBµV/m) extrapolated to 30 m (40 dB/decade) |
|-----------------|---|--|
| 13.350 | 30.84 | -9.16 |

| MultiView | Receiver | | | | | | |
|-----------------------------------|------------------------|---------------------------|---------|------|----------|--------------|------------------|
| Meas BW (QPK | () 9 kHz Meas Time | e 100 ms | | | | | |
| Att Input | 0 dB Preamp 1 DC PS | Off Step LI On Notch O | N ff | | | Frequency 13 | 3.4100000 MHz |
| TDF Input1 "0242_A | ntenna_Field_9KHz-30 | MHz_08-2022" | | | | | o 1QP Clrw |
| 2.50011 | | | | | | M1 | [1] 30.84 dBµV/m |
| 120 dBµV/m | | | | | | | 13.350000 MHz |
| | | | | | | | |
| 110 dBµV/m | | | | | | | |
| 100 dBµV/m | | | | | | | |
| 90 dBµ∀/m | | | | | | | |
| 90 08µV/m | | | | | | | |
| 80 dBµV/m | H1 80.510 dBµV/m | | | | | | |
| 70 dBµV/m | | | | | | | |
| | | | | | | | |
| 60 dBµV/m | | | | | | | |
| 50 dBµV/m | | | | | | | |
| 10 10 11/1 | | | | | | | |
| 40 dBµV/m | | | | | M | 1 | |
| 30 dBµV/m | | | | | <u> </u> | <u> </u> | \sim |
| 20 dBµV/m | | | | | | \mathbf{X} | ~ |
| | X | | | | | | ~ |
| 10 dBµV/m- | | | | | | | |
| Ctout 12 11 MU- | | | | | | | Ctop 12 41 MU |
| Start 13.11 MHz | | | | | | | Stop 13.41 MHz |

The limit shown in the above plot is extrapolated to 3 meters



| Frequency (MHz) | Maximum field strength (dBµV/m) measured at 3 m (quasi-peak detector) | Maximum field strength (dBµV/m) extrapolated to 30 m (40 dB/decade) |
|-----------------|---|--|
| 13.402 | 16.52 | -23.48 |

| | ctrum 🛞 | | | | |
|------------------|--|---|---------------------------------|------------------------------|----------------------------------|
| Input 1 DC 👄 Att | SPR)9 kHz MT 100 ms 0 dB Preamp OFF Ste | | /IHz_Efeild_3m_Ant0242.TDF ALC4 | I_MAYO2021\CABLE_7645_3m.TDF | ALC4_MAYO2021\CABLE_6710_11m.TDF |
| Scan 😝1QP Clrw | | | | | |
| | | | M1[1] 0.000 s | | 16.52 dBµ∀/m 13.402000 MHz |
| 120 dBµV/m | | | | | |
| 110 dBµV/m | | | | | |
| 100 dBµV/m | | | | | |
| 100 00000 | | | | | |
| 90 dBµV/m | | | | | |
| 80 dBpV/mD1 8 | 30.510 dBµV/m= | | | | |
| 70 dBµV/m | | | | | |
| 60 dBµV/m | | | | | |
| 60 UBHV/m- | | | | | |
| 50 dBµV/m | | | | | |
| 40 dBµV/m | | - | | | |
| 30 dBµV/m | | | | | |
| | | | | | |
| 20 dBµV/m | | | | | |
| 10 dBµV/m- | | | | | |
| Start 13.11 MHz | | | | | TF Stop 13.41 MHz |

The limit shown in the above plot is extrapolated to 3 meters



- Band 13.710-14.010 MHz

• RFID mode ISO 14443A:

| Frequency (MHz) | Maximum field strength (dBµV/m) measured at 3 m (quasi-peak detector) | Maximum field strength (dBµV/m) extrapolated to 30 m (40 dB/decade) |
|-----------------|---|--|
| 13.770 | 30.35 | -9.65 |

| | | | | | | | | |
|--------------------------------------|--|----------------------------|---------|---|---|---|--------------|--------------------------------|
| MultiView | Receiver | | | | | | | • |
| Att Input TDF Input1 "0242_A | () 9 kHz Meas Time 100 0 dB Preamp 1 DC PS Intenna_Field_9KHz-30MHz | Off Step Lif On Notch O | N ff | | | | Frequency 14 | .0100000 MHz |
| 2 Scan | | | | [| | | M1 | 0 1QP Clnw [1] 30.35 dBµV/m |
| 120 dBµV/m | | | | | | | MI | 13.770000 MHz |
| 110 dBµV/m | | | | | | | | |
| 100 dBµV/m | | | | | | | | |
| | | | | | | | | |
| 90 dBµV/m | | | | | | | | |
| -80-dBµ∀/m | H1_80.510_dBµV/m | | | | | | | |
| 70 dBµV/m | | | | | | | | |
| 60 dBµV/m | | | | | | | | |
| 50 dBµV/m | | | | | | | | |
| 40 dBµV/m | | | | | | | | |
| 30.dBµV/m | M1 | | | | | | | |
| 20 dBµV/m- | | | \sim | | | | | _ |
| | | | \sim | | | | | ′ \ |
| 10 dBµV/m | | | | | | | | |
| Start 13.71 MHz | | | | 1 | 1 | 1 | | Stop 14.01 MHz |

The limit shown in the above plot is extrapolated to 3 meters



| Frequency (MHz) | Maximum field strength (dBµV/m) measured at 3 m (quasi-peak detector) | Maximum field strength (dBµV/m) extrapolated to 30 m (40 dB/decade) |
|-----------------|---|--|
| 13.718 | 16.50 | -23.50 |

| Receiver | Spectrum 🛞 | | | | |
|-------------------|---|-----------------------------------|--------------------------------|----------------------------|---------------------------------|
| Input 1 DC 👄 | RBW (CISPR) 9 kHz MT 100 ms Att 0 dB Preamp OFF \$ | ALC4_MAYO2021\9kHz_30 Step LIN | MHz_Efeild_3m_Ant0242.TDF ALC4 | MAYO2021\CABLE_7645_3m.TDF | ALC4_MAYO2021\CABLE_6710_11m.TC |
| Scan 😑 1QP (| | | | | |
| | | | M1[1] 0.000 s | | 16.50 dBμV/r 13.718000 MH |
| 120 dBµV/m | | | | 7 | |
| | | | | | |
| 110 dBµV/m— | | | | | |
| 100 dBµV/m | | | | | |
| | | | | | |
| 90 dBµV/m | | | | | |
| 90 dBuly/m | D1 80.510 dBµV/m | | | | |
| 00 dbp v/m | | | | | |
| 70 dBµV/m | | | | | |
| | | | | | |
| 60 dBµV/m | | | | | |
| 50 dBµV/m | | | | | |
| finite surrouters | | | | | |
| 40 dBµV/m | | | | | |
| 30 dBµV/m | | | | | |
| | | | | | |
| 20 dBuV/m | | | | | |
| 10 dBµV/m- | | | · | | |
| | | | | | |
| Start 13.71 M | MHz | | | | Stop 14.01 MHz |

The limit shown in the above plot is extrapolated to 3 meters



FCC 15.225 (d) / RSS-210 B.6 (a)(iv) Field Strength of Emissions outside of the band 13.110 MHz - 14.010 MHz

SPECIFICATION:

Field strength of any emissions appearing outside of the band 13.110 MHz - 14.010 MHz band shall not exceed the general radiated emission limits in 15.209/RSS-Gen:

| Frequency Range (MHz) | Field strength (µV/m) | Field strength (dBµV/m) | Measurement distance (m) |
|--------------------------|-----------------------|----------------------------|-----------------------------|
| 0.009-0.490 | 2400/F(kHz) | - | 300 |
| 0.490-1.705 | 24000/F(kHz) | - | 30 |
| 1.705 - 30.0 | 30 | 29.54 | 30 |
| 30 - 88 | 100 | 40 | 3 |
| 88 - 216 | 150 | 43.5 | 3 |
| 216 - 960 | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

RESULTS:

All tests were performed in a semi-anechoic chamber at a distance of 3 m.

The spectrum was inspected from 9 kHz to 200 MHz searching for spurious signals.

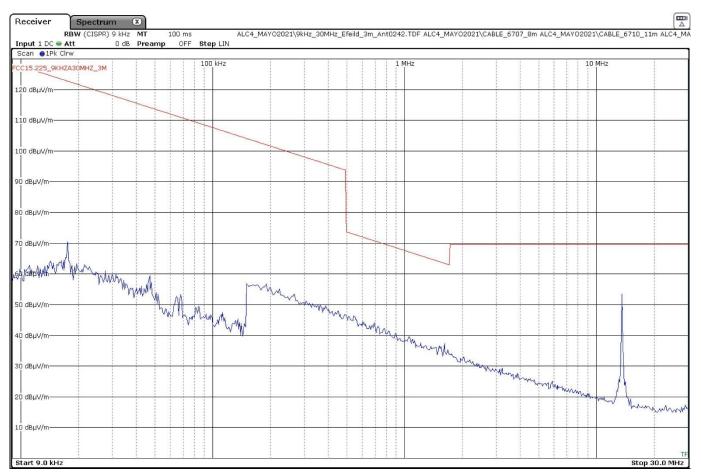
The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifier gain.



- Frequency range 9 kHz - 30 MHz:

• RFID mode ISO 14443A:

No spurious frequencies were found at less than 20 dB of the limit.

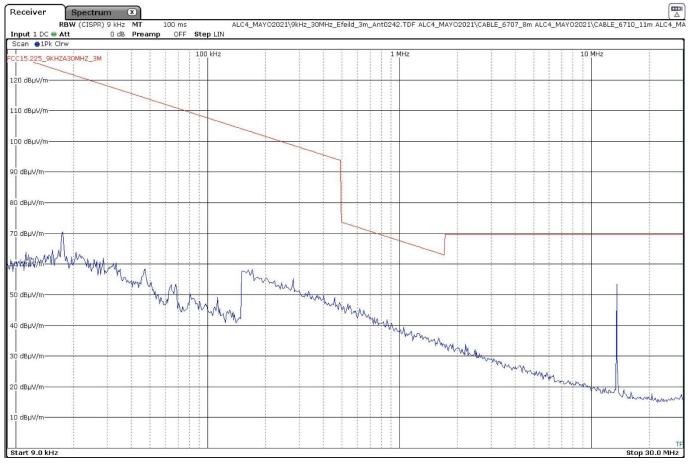


The limits shown in the above plot are extrapolated to 3 meters. The highest peak corresponds to the carrier level.

Resolution bandwidth: 200 Hz for 9 kHz \leq f \leq 150 kHz 9 kHz for 150 kHz \leq f \leq 30 MHz DEKRA Testing and Certification, S.A.U. Parque Tecnológico de Andalucía, c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España C.I.F. A29507456



• RFID mode ISO 15693:



No spurious frequencies were found at less than 20 dB of the limit.

The limits shown in the above plot are extrapolated to 3 meters. The highest peak corresponds to the carrier level.

Resolution bandwidth: 200 Hz for 9 kHz \leq f \leq 150 kHz 9 kHz for 150 kHz \leq f \leq 30 MHz



- Frequency range 30 - 200 MHz:

• RFID mode ISO 14443A:

No spurious frequencies were found at less than 20 dB of the limit.

| | | | | | | | | | (*) |
|---|--|--|---------------------------------|---------------------------------------|----------------------|--------------------|--|--|---|
| MultiView = I | Receiver × | Spectrum | × | | | | | | • |
| Ref Level 70.00 d Att Input TDE Input2 "ANTENA | OdB SWT 30 ms | RBW 100 kHz VBW 300 kHz Notch Off 6021"."AMPLIFICADO | Mode Sweep |)7 8M"."CABLE 9122 | 3M"."CABLE 9213 2 | 2M"."CABLE 9110 1M | μ | Frequency 115 | 5.0000000 MHz |
| 1 Frequency Swee | | | | | | | | | o1Pk View |
| Limit Check Line FCC15 | | | P P | ASS ASS | | | | | |
| 60 dBµV/m | | | | | | | | | |
| 50 dBµV/m | | | | | | | | | |
| -40-d8µV/m | | | | | | | | | |
| FCC15 | | | | | | | | | |
| 30 dBµV/m | | | | | | | | | |
| 20 dBµV/m | | | | | | | | | |
| 10 depairie | | | | | at the second second | and a share to be | a fan te er fan te fan ser fan te fan de fan de fan ser fan se General of general general general ser fan ser f | and a second second second from the | a anna an tar tha tha an tar an ta |
| | a start we were a direct | for hand a list life bet bline a friedra de | in a start of the second second | and which is delivery of the state of | | | and the state of t | and a second from a single production of the second second | A free include integration, management (brow |
| O dBµV/m−−−− | an a | and the second sec | | | | | | | |
| -10 dBµV/m | | | | | | | | | |
| | | | | | | | | | |
| -20 dBµV/m | | | | | | | | | |
| 30.0 MHz | | | 30000 pts | 5 | | 17.0 MHz/ | | | 200.0 MHz |

The above plot shows the results of the scan using peak detector.

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• RFID mode ISO 15693:

No spurious frequencies were found at less than 20 dB of the limit.

| | | | | | | | | | |
|---|------------------------------|---|-------------------|--------------------------|--------------------------|--|---|---------------|---------------|
| MultiView | Receiver × | Spectrum | × | | | | | | • |
| Ref Level 70.00 | OdB SWT 30 ms | RBW 100 kHz VBW 300 kHz Notch Off | Mode Sweep | | | | | Frequency 11! | 5.0000000 MHz |
| Input TDF Input2 "ANTENA 1 Frequency Swee | _6143_AF","ATT_3DB_ | Notch Off _6021","AMPLIFICADO | R_6142","CABLE_67 | 07_8M","CABLE_9122 | _3M","CABLE_9213_2 | 2M","CABLE_9110_1M | n. | | o 1Pk View |
| Limit Check | | | P | ASS | | | | | O IPK VIEW |
| Line FCC15 | | | | ASS | | | | | |
| 60 dBµV/m | | | | | | | | | |
| 00 00000000 | | | | | | | | | |
| | | | | | | | | | |
| 50 dBµV/m | | | | | | | | | |
| | | | | | | | | | |
| 40-dBµV/m | | | | | | | | | |
| FCC15 | | | | | | | | | |
| | | | | | | | | | |
| 30 dBµV/m | | | | | | | | | |
| | | | | | | | | | |
| 20 dBµV/m | | | | | | | | | |
| | | | | | | | | | |
| Manual . | | | | | | | | | |
| 10 SEPTIME | | | | an ana kasa a sa babbaar | an and all a standard of | فأني اللافا ويدوعا وروريا وراوتك ووا | | | |
| The Date of the Association | المصرية المقاطرين وبالطاطرين | delegente di tra de parti de la contra de la c | | | | and which there are a state of the street bird and | discussion of the fit | | |
| 0 dBµV/m | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| -10 dBµV/m | | | | | | | | | |
| | | | | | | | | | |
| -20 dBµV/m | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 30.0 MHz | | | 30000 pt | 5 | | 17.0 MHz/ | | | 200.0 MHz |

The above plot shows the results of the scan using peak detector.



FCC 15.225 (e) / RSS-210 B.6 (b) Frequency Tolerance of the Carrier Signal

SPECIFICATION:

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

RESULTS:

Nominal Operating Frequency: 13.56 MHz.

• RFID mode ISO 14443A:

Frequency Stability over Temperature Variations:

| Temperature (°C) | Frequency Error (kHz) | Frequency Error (%) |
|------------------|-----------------------|---------------------|
| +50 | 0.066000 | 0.000487 |
| +40 | 0.073500 | 0.000542 |
| +30 | 0.079500 | 0.000586 |
| +20 | 0.082500 | 0.000608 |
| +10 | 0.009300 | 0.000069 |
| 0 | 0.423015 | 0.003120 |
| -10 | 0.032700 | 0.000241 |
| -20 | 0.041700 | 0.000308 |

Frequency Stability over Voltage Variations:

| DC Voltage | Voltage (V) | Temperature (°C) | Frequency Error (kHz) | Frequency Error (%) |
|------------|-------------|------------------|-----------------------|---------------------|
| Vmax | 4.95 | 20 | 0.066000 | 0.000487 |
| Vmin | 3.825 | 20 | 0.073500 | 0.000542 |



Frequency Stability over Temperature Variations:

| Temperature (°C) | Frequency Error (kHz) | Frequency Error (%) |
|------------------|-----------------------|---------------------|
| +50 | 0.078000 | 0.000575 |
| +40 | 0.078000 | 0.000575 |
| +30 | 0.081000 | 0.000597 |
| +20 | 0.085500 | 0.000631 |
| +10 | 0.025800 | 0.000190 |
| 0 | 0.414615 | 0.003058 |
| -10 | 0.028200 | 0.000208 |
| -20 | 0.044700 | 0.000330 |

Frequency Stability over Voltage Variations:

| DC Voltage | Voltage (V) | Temperature (°C) | Frequency Error (kHz) | Frequency Error (%) |
|------------|-------------|------------------|-----------------------|---------------------|
| Vmax | 4.95 | 20 | 0.078000 | 0.000575 |
| Vmin | 3.825 | 20 | 0.078000 | 0.000575 |